CLAIMS

1. A method of using reverse micelles as nano-reactors for the growth of metal colloids comprising:

growing a magnetic core material; and

coating the surface with a diamagnetic coating.

2. The method of claim 1, wherein the magnetic core material is from the group consisting of iron and cobalt.

3. A method of using reverse micelles as nano-reactors for the growth of metal colloids comprising:

growing a thin layer of magnetic material on a diamagnetic core; and

coating the surface with a diamagnetic coating.

4. The method of claim 3, wherein cetyltrimethylammonium bromide, n-butanol, octane and aqueous reactants are used to synthesize a nanocomposite.

5. The method of claims 3 or 4, used to form a nanocomposite having a gold core onto which a thin layer of iron is grown, which is then passivated with gold.

6. Stable nanoparticles formed by the method of any one of claims 1-5.

7. Ferrofluids made with nanoparticles of claim 6.

8. Granular GMR materials made with the nanoparticles of claim 6.

9. Inductor materials made with the nanoparticles of claim 6.

10. Storage media made with the nanoparticles of claim 6.

11. Giant magnetoresistance sensors made with the nanoparticles of claim 6.

12. Directed drug delivery agents made with the nanoparticles of claim 6.

13. Agents for targeted sensing for *in vivo* applications made with the nanoparticles of claim 6.

14. A nanocomposite comprising:

a diamagnetic core;

a thin layer of magnetic material formed on the diamagnetic core;

a passivating layer of diamagnetic material formed on the layer of magnetic material.

15. The nanocomposite of claim 14, wherein:

the diamagnetic core is a material from the group consisting of gold, silver, copper, and platinum;

the magnetic material is a material from the group consisting of iron and cobalt and alloys containing iron and/or cobalt;

the passivating layer is a material from the group consisting of gold, silver, platinum, and copper, and alloys containing these materials.

16. A nanocomposite comprising:

a gold core;

a thin layer of iron formed on the gold core;

a passivating layer of gold on the layer of iron.

17. The nanocomposite of claims 14, 15, or 16 produced with a reverse micelle synthesis technique.

18. The nanocomposite of claims 14, 15, or 16, synthesized using cetyltrimethylammonium bromide, n-butanol, octane and aqueous reactants.

19. Ferrofluids made with nanocomposites of any one of claims 14-18.

20. Granular GMR materials made with nanocomposites of any one of claims 14-18.

21. Inductor materials made with nanocomposites of any one of claims 14-18.

22. Storage media made with nanocomposites of any one of claims 14-18.

23. Giant magnetoresistance sensors made with nanocomposites of any one of claims 14-18.

24. Directed drug delivery agents made with nanocomposites of any one of claims 14-18.

25. Agents for targeted sensing for *in vivo* applications made with nanocomposites of any one of claims 14-18.

26. The nanocomposite of claim 14, wherein:

the diamagnetic core is a material from the group consisting of gold, silver, copper, and platinum;

the magnetic material is a material from the group consisting of iron and cobalt and platinum alloys containing iron and/or cobalt;

the passivating layer is a material from the group consisting of gold, silver, platinum, and copper, and alloys containing these materials.

27. The invention of any prior claim, wherein the nanocomposites are annealed.

28. The invention of claim 27, wherein the nanocomposites are annealed at a temperature of about 300 K.

29. The invention(s) substantially as described herein and in the papers attached hereto or to the provisional patent application on which this application claims priority.